DUSTEX
The bio-based road binder

CASE STUDY // STATENS VEGVESEN // 09/2019

Improving roads and sustainability with Dustex – a 15-year road study

Summary

In 2001, the county councils in Møre og Romsdal, Norway entered the gravel road program to raise the standard of its county roads. The goal was to lay an asphalt surface on all gravel roads, thus improving the infrastructure and everyday lives of road users.

Due to poor road base and materials, several of the stretches on the county roads had to be rehabilitated and stabilized before a permanent surface could be laid. Between 2002 and 2006, DUSTEX was used by the Norwegian Public Roads Administration (NPRA) as a binder for the stabilization of a total of 17 km of county road on five stretches. Measurements of bearing capacity and rut depth 11-15 years after road construction with DUSTEX show that the road stretches maintained their load bearing capacity and four of the five stretches have a rut depth development that is consistent with or better than what is stipulated as the standard in N200[1]. On the stretch that performed worse, the cause is thought to be heave problems that would have occured regardless of the stabilization method used.

Roads containing Dustex are now constructed annually in Norway. Between 2016 and 2018 alone, almost 100 km of roads were stabilized with Dustex.

Keyfacts

- **Green and sustainable**
- **CO2 neutral process**
- **Wood-based material**
- **Non-toxic and non-irritating**

Dustex is the only commercial road binder with an Environmental Product Declaration (EPD)

[1] N200 is released by the Norwegian Public Roads Administration. This handbook recommends construction materials and road building methods. If these recommendations are followed, N200 issues expected lifespans of specific asphalt layers.

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Solution

DUSTEX is a bio-based polymer derived from trees and is considered nature's own binder. The NPRA has used DUSTEX for dust suppression on gravel roads for many years. It has been observed that a steady supply of DUSTEX resulted in a solid road with a stable surface. The road surface became firmer and less prone to frost heaves and spring break-up. Based on these observations, it was decided to test DUSTEX as a binder for stabilization of the road base.

In the districts of Nordmøre and Romsdal, DUSTEX was used for the stabilization of 17 km of roads. Two layers of asphalt were then laid over the stabilized base layer. DUSTEX was applied by using either milling machines with spray nozzles or graders in combination with sprayers. Stabilization with DUSTEX made the base layer acceptable to be paved with asphalt with very little or no need for new aggregate. Load bearing capacity and rut depth measurements along with visual assessments were taken of the roads regularly until 2017.

Results

Despite poor base and sub-base[2], stabilization with DUSTEX created roads that have maintained the same load carrying capacity as when originally constructed. Further, the rut depth development also complies with or is better than the stipulated N200 standard lifetime for four of the five stretches. Fv 160-01 had a lower service life due to heave problems that would have occurred regardless of the type of base layer stabilization. Table 1 characterizes the roads stabilized, the DUSTEX application used and the projected lifespan per NPRA's evaluation.

Road	Year	Traffic	Length	Asphalt layer thickness	DUSTEX application method	Projected lifespan versus N200 Standard
Fv324-01	2002	AADT: 250, with 6% heavy vehicles	1800 m	5 cm	Milling machine with spray nozzles	19 years Standard: 16 ± 2 years
Fv181-01	2002	AADT: 100, with 10% heavy vehicles	772 m (1900m)[3]	6 cm	Milling machine with spray nozzles	21 years Standard: 16 ± 2 years
Fv302-01	2005	AADT: 430, with 10% heavy vehicles.	7860 m	6 cm	Milling machine with spray nozzles	21 years Standard: 13 ± 2 years
Fv160-01	2005	AADT: 250, with 6% heavy vehicles	900 m	6 cm	Milling machine with spray nozzles	9 years Standard: 16 ± 2 years
Fv286-02	2006	AADT: Approx. 200	4830 m	7 cm	Grader and sprayer	14 years Standard: 13 ± 2 years

Table 1: Road data & expected surface lifespan

[2] On several stretches it was found that the road body contained materials not suited for road building as stated in Handbook N200 Road building. I.e. Humus, topsoil and bog.
[3] Parts of Fv 181-01 Eidsbygda-Nordvika were re-paved in 2014. Expected surface life span presented relates to the stretch 4004 – 4776 m with paving from 2002.

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"It does not have the environmental disadvantages that bitumen emulsion has."

"For NPRA there should be an argument that the binding agent is environmentally friendly and harmless."

Norwegian Public Roads Administration, 2017

From HP/M:1 /4004 To HP/M: 1 / 4776 (772 meters)

Rut 90/50: 20 / 7,1
Critical year rut: 2023
IRI 90/50: 5,1 / 3,6
Critical year IRI: 2036

Date of last data collection: 2018.06.20
Date of paving: 2002.11.28
Paving: Soft asphalt
Paving width: 4,3

AADT: 100
Surface lifespan rut: 21
Surface lifespan IRI: 34

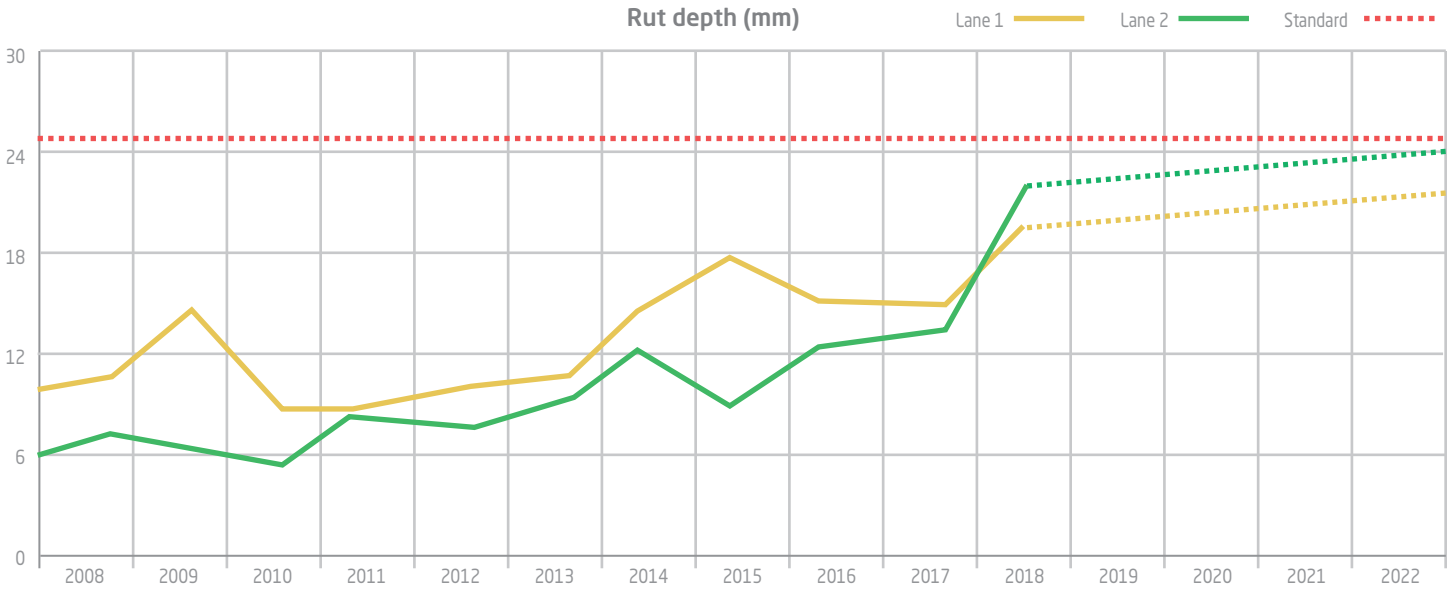

Fig. 1: Rut depth development and expected life span of Fv 181-01 Eidsbygda-Nordvika

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Conclusions

Over 15 years of application and evaluation, Dustex has proven to be an accepted alternative to bitumen for FDR and road stabilization applications in Norway. By using Dustex, road builders are able to use inferior road base materials for road construction, but still meet the N200 road standard. This offers significant savings in road construction. Additionally, Dustex is environmentally friendly and sustainable unlike bitumen. Norway continues to exhibit confidence in the product by expanding its use of Dustex. Between 2016 and 2018 alone, over 100 km of Norwegian roads were constructed using Dustex.

References

Road technology - Base layer stabilization with DUSTEX; Follow-up of R&D report no. 2008003393-1 (2017), The Norwegian Public Roads Administration

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